

CONTRIBUTIONS
FROM THE
CUSHMAN LABORATORY
FOR
FORAMINIFERAL RESEARCH

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CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

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These Contributions will be issued quarterly. They will contain short papers with plates, describing new forms and other interesting notes on the general research work on the foraminifera being done on the group by the workers in this laboratory. New literature as it comes to hand will be briefly reviewed.

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CONTRIBUTIONS FROM THE CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

279. SOME FORAMINIFERA OF WOODBINE AGE FROM TEXAS, MISSISSIPPI, ALABAMA, AND GEORGIA*

BY JOSEPH A. CUSHMAN and ESTHER R. APPLIN

Published accounts of studies of the outcropping Woodbine formation have appeared from time to time over a long period of years, and recently additional studies and reëxamination of outcrops of this formation have been undertaken by geologists of the Geological Survey and other groups. Although not yet crystallized in published form, the results of the work by the Geological Survey may indicate that some revision of the boundaries of the Woodbine formation are desirable throughout at least part of the outcrop area. Furthermore, it is the opinion of some geologists that the units into which the formation has heretofore been divided may not actually be appropriate for clear and precise areal mapping.

The arenaceous micro-fauna described in this article is commonly found in marine shales of the outcropping Lewisville and Dexter members of the Woodbine formation, and also in outcropping beds which have been assigned to the "Tarrant" formation as part of the Eagle Ford in Denton, Dallas, Grayson, and Tarrant Counties, Texas. A similar micro-fauna was found in a sample of upper Woodbine shale collected in Fannin Co., Texas. Because of the unstable status of the subdivisions of the Woodbine, the micro-fauna from the outcropping beds is, in this article, referred to the Woodbine formation, undifferentiated.

A micro-faunal group which is closely similar to that found in the outcropping Woodbine formation of Texas has been recognized in core and cutting samples taken through the interval of the so-called "marine shale zone of the Tuscaloosa" in many wells in the southeastern part of the Coastal Plain from Mississippi to west Florida and South Carolina. Similarities were also noted between the micro-fauna found in samples taken on the outcrop of the Woodbine and the micro-fauna recently described from the type locality of the Pepper shale of Texas.¹ In an article to be

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¹ Loeblich, Alfred R. Jr. "Foraminifera from the Type Pepper Shale of Texas," *Journ. Pal.*, vol. 20, No. 2, 1946, pp. 130-139, pl. 22.

published later a more complete discussion will be given of the relationships of the several faunal groups mentioned above.

A general similarity in lithology has been observed between the microfossiliferous shales of the Woodbine formation and those seen in well samples from the "marine shale of the Tuscaloosa." Dark gray, somewhat carbonaceous, thinly laminated shale with thin limonitic and silty to finely sandy lenses is common on the outcrop of the Woodbine, while the shale of the "marine Tuscaloosa," though generally similar, is usually more micaceous and more frequently glauconitic. Both on the outcrop of the Woodbine and in well sections in the southeastern states, the micro-fossiliferous shales are often closely associated with beds of fine grained glauconitic and carbonaceous sandstones which contain species of *Ostrea* and other shallow-water macro-fossils. The lithologic character of the shales as well as the character of both the macro- and micro-faunas suggests shallow to brackish-water conditions of deposition.

Collections of outcrop material for microscopic study were made by Watson H. Monroe, Harlan R. Bergquist, Paul L. Applin, and Esther R. Applin, geologists, U. S. Geological Survey.

Family LITUOLIDAE

Genus AMMOBACULITES Cushman, 1910

AMMOBACULITES JUNCUS Cushman and Applin, n. sp. (Pl. 13, fig. 2)

Test elongate, the earlier portion planispiral, slightly depressed in the center, composed of 5 to 8 chambers, later portion uniserial, straight, cylindrical, composed of 4 or 5 chambers, increasing little if at all in size as added; sutures slightly depressed; wall coarsely arenaceous, surface roughened; aperture terminal, rounded, without a definite neck. Length 0.55-0.80 mm.; breadth 0.20-0.30 mm.; diameter of uniserial portion 0.20-0.23 mm.

Holotype (Cushman Coll. No. 45572) from the Upper Cretaceous, upper part of the Woodbine formation, buff colored sand and sandy shale taken in a valley tributary to the Trinity River near east edge of Tarrant County, Texas. A 4-foot exposure below ledge of fossiliferous "Tarrant" limestone in creek bank, 50' S. of dike of earthen stock tank and about 800' N. of Dorothy switch. Collected by H. R. Bergquist.

This species resembles *A. subcretaceus* Cushman and Alexander but differs from the types in the larger number of chambers and less compressed test.

AMMOBACULITES STEPHENSONI Cushman (Pl. 13, fig. 1)

Ammobaculites stephensoni CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 9, 1933,

p. 49, pl. 5, fig. 2; vol. 20, 1944, p. 2, pl. 1, fig. 3.—CUSHMAN and DEADERICK, Journ. Pal., vol. 18, 1944, p. 329, pl. 50, fig. 3.

The range of this species is apparently in the Taylor, Austin, Eagle Ford, and Woodbine divisions of the Upper Cretaceous. Specimens apparently belonging to this species occurred at several stations in the upper and middle parts of the Woodbine formation of Texas and in the "marine shale of the Tuscaloosa" in wells in Alabama and Georgia.

AMMOBACULITES BERGQUISTI Cushman and Applin, n. sp. (Pl. 13, figs. 4, 5)

Test fairly elongate, compressed, periphery rounded, early portion planispiral, somewhat involute, usually umbonate, later portion rectilinear, uniserial; chambers fairly distinct except in the coiled portion where they increase gradually in size as added, in the uniserial portion few, only 2 or 3, of nearly uniform size, width much greater than the height; sutures of the early coiled portion indistinct, in the uniserial portion distinct and somewhat depressed; wall finely arenaceous, light brown in color, surface only slightly roughened; aperture terminal, rounded, with a distinct, slightly projecting neck. Length 0.60-0.90 mm.; breadth 0.35-0.40 mm.; diameter of uniserial portion 0.28-0.40 mm.

Holotype (Cushman Coll. No. 45574) from the Upper Cretaceous, upper part of the Woodbine formation, eroded hillside along old highway approximately 2 mi. E. of Whitesboro, Grayson County, Texas. Sample of dark gray shale from a 4-foot interval the top of which is about 55' below the base of the Eagle Ford. Collected by H. R. Bergquist.

This species also occurs in the middle part of the Woodbine formation and in the "marine shale of the Tuscaloosa" of Alabama and Georgia. The species is close to *A. obscurus* Loeblich from the Pepper shale of Texas but is larger and has a distinct apertural neck.

AMMOBACULITES COMPRIMATUS Cushman and Applin, n. sp. (Pl. 13, fig. 3)

Test close coiled except the last one or two chambers which tend to uncoil, involute, periphery broadly rounded; chambers fairly distinct, about 5 in the last coil, increasing gradually in size as added; sutures distinct, slightly depressed and slightly curved in the coiled portion, more distinctly depressed in the later portion; wall arenaceous, of rather uniformly sized grains neatly cemented, surface smooth; aperture in the adult terminal, small, rounded, at the end of a short but distinct neck. Length 0.55-0.60 mm.; breadth 0.35-0.40 mm.

Holotype (Cushman Coll. No. 45576) from the Upper Cretaceous, upper part of the Woodbine formation, dark gray calcareous shale overlying a 1-foot bed of tuffaceous sandstone exposed on a hillside above a

small pond, 0.9 mi. S. 45° W. of the center of Loy State Park Lake, 2 mi. SW. of Denison, Grayson County, Texas. Collected by H. R. Bergquist.

This species differs from *A. obscurus* Loeblich in the more distinct chambers and sutures, less tendency to uncoil, more rounded test, and the distinct apertural neck.

AMMOBACULITES BRAUNSTEINI Cushman and Applin, n. sp. (Pl. 13, fig. 7)

Test fairly large, compressed, earlier portion close coiled but nearly involute, later gradually uncoiling with only 2 or 3 entirely uncoiled chambers in the adult, periphery rounded, sides flattened; chambers fairly distinct in the coiled portion, usually 5 or 6, in the uncoiled portion more distinct, increasing gradually and rather uniformly in size as added; sutures distinct, slightly depressed in the later portion, rather thick and darker than the walls of the chamber; wall coarsely to finely arenaceous with the surface fairly smooth, brownish in color; aperture terminal, but without a distinct neck. Length 0.80-1.15 mm.; breadth 0.40-0.60 mm.

Holotype (Cushman Coll. No. 45577) from core in the Upper Cretaceous, "marine shale of the Tuscaloosa," at 6380-90', Gulf Refining Co., Stanley No. 1, SE. ¼ SE. ¼ sec. 36, T. 10 N., R. 9 W., Eucutta Field, Wayne County, Mississippi.

This species is common in many of the well samples from the Woodbine formation in Texas, and "marine shale of the Tuscaloosa" in Mississippi and Alabama. It differs from *A. subcretaceus* Cushman and Alexander in the broader form, more involute early portion, and the prominent, thickened sutures.

There is a wide variation in specimens referred to this species, many of the forms being much narrower than the typical form, but there seem to be all grades between the two extremes.

AMMOBACULITES cf. FRAGMENTARIUS Cushman

Specimens of a form which is very closely related to this species described from the Upper Cretaceous of Canada are common at one outcrop of the Woodbine formation in Denton Co., and are present, although generally rare, at several other localities in Denton and Grayson Counties in Texas.

Family TEXTULARIIDAE

Genus **AMMOBACULOIDES** Plummer, 1932

AMMOBACULOIDES PLUMMERAE Loeblich (Pl. 13, fig. 6)

Ammobaculoides plummerae LOEBLICH, Journ. Pal., vol. 20, 1946, p. 137, pl. 22, figs. 10-12, text figs. 3a-g.

Specimens from the upper part of the Woodbine formation of Texas have been compared with the types of this species from the Pepper shale

of Texas and seem identical. Less typical specimens occur in the "marine shale of the Tuscaloosa," at 4280'-95', Pan American Adams-McCaskill, Pierce Co., Georgia.

Family TROCHAMMINIDAE

Genus TROCHAMMINA Parker and Jones, 1859

TROCHAMMINA RAINWATERI Cushman and Applin, n. sp. (Pl. 13, fig. 9)

Test small, trochoid, biconvex, periphery subacute; chambers distinct, 6 in the last-formed whorl, slightly inflated, increasing gradually and regularly in size as added; sutures distinct, slightly depressed on the dorsal side, strongly oblique, ventrally nearly radiate; wall finely arenaceous, surface nearly smooth; aperture a low elongate opening on the ventral margin of the last-formed chamber. Diameter 0.40-0.45 mm.; thickness 0.15-0.20 mm.

Holotype (Cushman Coll. No. 45579) from the Upper Cretaceous, upper part of the Woodbine formation, eroded hillside along old highway approximately 2 mi. E. of Whitesboro, Grayson County, Texas. Sample of dark gray shale from a 4-foot interval the top of which is about 55' below the base of the Eagle Ford. Collected by H. R. Bergquist.

Similar specimens occur in well samples from the "marine shale of the Tuscaloosa" in Mississippi and Alabama. This species differs from *T. wickendeni* Loeblich in the thicker test, slightly larger number of chambers, and different angles to the sutures.

TROCHAMMINA EXIGUA Cushman and Applin, n. sp. (Pl. 13, fig. 8)

Test small, strongly convex on the ventral side, dorsal side less convex, periphery broadly rounded, ventral side umbilicate; chambers 5 or 6 in the final whorl, strongly inflated on the ventral side, only slightly so on the dorsal side, increasing gradually in size as added; sutures deeply depressed ventrally, slightly so dorsally, slightly curved dorsally, ventrally slightly curved to nearly radiate; wall distinctly arenaceous but the surface smoothly finished; aperture an elongate, slightly arched opening on the umbilical portion of the last-formed chamber. Diameter 0.25-0.28 mm.; thickness 0.15 mm.

Holotype (Cushman Coll. No. 45580) from the Upper Cretaceous, upper part of the Woodbine formation, dark gray calcareous shale overlying a 1-foot bed of tuffaceous sandstone exposed on a hillside above a small pond, 0.9 mi. S. 45° W. of the center of Loy State Park Lake, 2 mi. SW. of Denison, Grayson County, Texas. Collected by H. R. Bergquist. Specimens apparently the same occur in well samples of the "marine shale of the Tuscaloosa" from Mississippi.

This species differs from *T. texana* Cushman and Waters in the greater convexity, deeper umbilicus, and smaller size.

280. A FORAMINIFERAL FAUNA FROM THE BYRAM MARL AT ITS TYPE LOCALITY*

BY JOSEPH A. CUSHMAN and RUTH TODD

A number of papers have been written on the foraminifera of the Byram marl and it is evident that the faunas vary somewhat in the different parts of the section. The material studied here was collected by W. H. Monroe from the type locality on Pearl River at Byram, Hinds Co., Miss. This has proved to have a very rich fauna with a number of new species and varieties as well as others not previously recorded from the Byram marl. A number of species previously recorded from the Byram marl were not found in this particular sample.

From the scarcity of Lagenidae and abundance of Miliolidae, Textulariidae, and other known warm, shallow-water forms, it would seem that this Byram marl fauna was deposited in a rather shallow, warm sea. As has previously been noted in the corals and the foraminifera, the fauna is closely related to that now living in the Indo-Pacific.

There are a few species in the Byram marl which have persisted from the upper Eocene and a few of the Byram things have apparently continued into the Miocene, but a large number of the species appear to be good index fossils for this portion of the Oligocene.

Family TEXTULARIIDAE

Genus SPIROPLECTAMMINA Cushman, 1927

SPIROPLECTAMMINA MISSISSIPPIENSIS (Cushman) (Pl. 13, fig. 10)

(For earlier references, see these Contributions, vol. 21, 1945, p. 80.)—STUCKEY, Journ. Pal., vol. 20, 1946, p. 163, pl. 29, figs. 6, 7, 11.

This species is a common one in the Oligocene and upper Eocene of the United States. The types are from the Byram marl of Mississippi.

SPIROPLECTAMMINA MISSISSIPPIENSIS (Cushman), var. ALABAMENSIS (Cushman) (Pl. 13, fig. 11)

Textularia mississippiensis CUSHMAN, var. *alabamensis* CUSHMAN, U. S. Geol. Survey Prof. Paper 133, 1923, p. 17, pl. 1, fig. 4.—HOWE, Journ. Pal., vol. 2, 1928, p. 175 (list).—ELLISOR, Bull. Amer. Assoc. Petr. Geol., vol. 17, No. 11, 1933, pl. 1, fig. 6.—CUSHMAN, U. S. Geol. Survey Prof. Paper 181, 1935, p. 7, pl. 1, figs. 5, 6.—DAVIS,

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Journ. Pal., vol. 15, 1941, p. 150, pl. 25, figs. 2, 3.—CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 66.

Spiroplectamina mississippiensis (CUSHMAN), var. *alabamensis* CUSHMAN and HERRICK, Contr. Cushman Lab. Foram. Res., vol. 21, 1945, p. 56, pl. 9, figs. 1-3.—CUSHMAN and TODD, l. c., p. 80, pl. 13, fig. 2.—CUSHMAN, Special Publ. 16, Cushman Lab. Foram. Res., 1946, p. 4, pl. 1, fig. 3.

This variety was described from the Oligocene of Alabama and is found in the Oligocene of Mississippi and Texas and the upper Eocene of Texas, Mississippi, Alabama, Georgia, and South Carolina.

SPIROPLECTAMMINA HOWEI Stuckey (Pl. 13, fig. 12)

Spiroplectamina howei STUCKEY, Journ. Pal., vol. 20, 1946, p. 164, pl. 29, figs. 8-10.

This species was described from the Oligocene of Red Bluff on the Chickasawhay River, 2½ miles north of Hiwannee, Miss. Our specimens seem to be identical when compared with typical specimens kindly supplied by the author.

Genus TEXTULARIA DeFrance, 1824

TEXTULARIA TUMIDULA Cushman (Pl. 13, fig. 13)

Textularia tumidulum CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 89, pl. 15, figs. 1, 2; Prof. Paper 129-F, 1922, p. 125; Prof. Paper 133, 1923, p. 15.—ELLISOR, Bull. Amer. Assoc. Petr. Geol., vol. 17, No. 11, 1933, pl. 1, fig. 3.—DAVIS, Journ. Pal., vol. 15, 1941, p. 152, pl. 25, fig. 10.—CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 65.

This species, described from the Byram marl, seems to be a characteristic one of the Vicksburg group of the Oligocene. It is recorded from Alabama, Mississippi, and Texas.

TEXTULARIA SUBHAUERII Cushman (Pl. 13, fig. 14)

Textularia subhauerii CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 89, pl. 14, fig. 2; Prof. Paper 129-F, 1922, p. 126; Prof. Paper 133, 1923, p. 16; Journ. Pal., vol. 1, 1927, p. 148, pl. 23, fig. 2.—COLE and GILLESPIE, Bull. Amer. Pal., vol. 15, No. 57b, 1930, p. 6.—CUSHMAN, U. S. Geol. Survey Prof. Paper 181, 1935, p. 8, pl. 1, fig. 10.—CUSHMAN and McGLAMERY, l. c., Prof. Paper 189-D, 1938, p. 103.—DAVIS, Journ. Pal., vol. 15, 1941, p. 152, pl. 25, fig. 15.—HOWE, l. c., vol. 16, 1942, p. 268 (list).—CUSHMAN and HERRICK, Contr. Cushman Lab. Foram. Res., vol. 21, 1945, p. 57.

This species was also described from the Byram marl and is widely recorded in the Oligocene and upper Eocene of the Coastal Plain region of the United States and Mexico.

Family VERNEUILINIDAE

Genus GAUDRYINA d'Orbigny, 1839

GAUDRYINA (SIPHOGAUDRYINA) YOUNGI Howe (Pl. 13, fig. 15)

Gaudryina youngi HOWE, Journ. Pal., vol. 4, 1930, p. 328, pl. 27, fig. 1.—CUSHMAN, Special Publ. 7, Cushman Lab. Foram. Res., 1937, p. 77, pl. 11, figs. 15, 16.—HOWE,

Journ. Pal., vol. 16, 1942, p. 267 (list).—CUSHMAN, Special Publ. 7A, Cushman Lab. Foram. Res., 1946, p. 21.

This species is known only from the Oligocene of Mississippi and Alabama and should be a good index fossil.

GAUDRYINA (SIPHOGAUDRYINA) GLABRATA (Cushman) (Pl. 13, figs. 16, 17)

Ehrenbergina glabrata CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 93, pl. 17, fig. 4; Prof. Paper 133, 1923, p. 24.—APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 9, 1925, p. 24.

Gaudryina (Siphogaudryina) glabrata CUSHMAN, Special Publ. 7, Cushman Lab. Foram. Res., 1937, p. 77, pl. 11, figs. 17, 18.

The types of this species are from the Byram marl. It seems to be an index fossil for the Oligocene and is known from Mississippi and Texas.

Family VALVULINIDAE

Genus LIEBUSELLA Cushman, 1933

LIEBUSELLA BYRAMENSIS (Cushman) (Pl. 13, fig. 20)

Clavulina byramensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 92, pl. 16, fig. 1; Prof. Paper 133, 1923, p. 22, pl. 2, fig. 3.—COLE and PONTON, Bull. 5, Florida State Geol. Survey, 1930, p. 28, pl. 11, fig. 2.—COLE and GILLESPIE, Bull. Amer. Pal., vol. 15, No. 57b, 1930, p. 6.

Liebusella byramensis CUSHMAN, Special Publ. 8, Cushman Lab. Foram. Res., 1937, p. 164, pl. 19, figs. 16-18.—GALLOWAY and HEMINWAY, New York Acad. Sci., Sci. Survey Porto Rico and Virgin Ids., vol. 3, pt. 4, 1941, p. 325, pl. 6, fig. 9.—HOWE, Journ. Pal., vol. 16, 1942, p. 267 (list).

This is another species the types of which are from the Byram marl. It is known from the Oligocene of Mississippi, Florida, Alabama, and Mexico, and from the Ponce formation of Porto Rico.

Family MILIOLIDAE

Genus QUINQUELOCULINA d'Orbigny, 1826

QUINQUELOCULINA GLABRATA Cushman (Pl. 13, fig. 19)

Quinqueloculina glabrata CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 141, pl. 34, fig. 8; Prof. Paper 133, 1923, p. 52.—APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 9, 1925, p. 24.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 549, pl. 72, figs. 1, 2.

The types are from the Mint Spring marl of Mississippi. It also occurs in the Byram marl of Mississippi, in the Marianna limestone of Mississippi and Florida, and in the Anahuac formation of Texas.

QUINQUELOCULINA VICKSBURGENSIS Cushman (Pl. 13, fig. 21)

Quinqueloculina venusta KARRER? var. CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 102, pl. 26, fig. 5.

Quinqueloculina vicksburgensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 141, pl. 34, fig. 6; Prof. Paper 133, 1923, p. 52.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 549, pl. 71, fig. 18.

The species is recorded only from the Oligocene, Byram marl, Glendon limestone, and Mint Spring marl of Mississippi, and from the Anahuac formation of Texas.

QUINQUELOCULINA BYRAMENSIS Cushman (Pl. 13, fig. 18)

Quinqueloculina byramensis CUSHMAN, U. S. Geol. Survey Prof. Paper 133, 1923, p. 54, pl. 8, fig. 5.

The only previous record for this highly ornate species is from the Byram marl of Mississippi. A number of specimens are present in our material.

QUINQUELOCULINA MONROEI Cushman and Todd, n. sp. (Pl. 14, figs. 1, 2)

Quinqueloculina bicostata D'ORBIGNY, var. CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 102, pl. 26, figs. 2-4; Prof. Paper 133, 1923, p. 52.

Test elongate, nearly $2\frac{1}{2}$ times as long as broad, much compressed, base and apertural end each somewhat projecting beyond the general outline of the test, periphery angled, in the earlier stages concave with two distinct costae somewhat rounded, the final chamber often with three or more distinctly raised costae with deep depressions between; chambers distinct, rather narrow; sutures distinct, slightly depressed; wall smooth except for the strongly developed costae; aperture rounded, at the end of the projecting apertural end of the chamber. Maximum length 1.50 mm.; breadth 0.60 mm.; thickness 0.40 mm.

Holotype (Cushman Coll. No. 46919) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss. It occurs commonly.

The species was previously recorded under d'Orbigny's name from the Byram marl, Glendon limestone, and Mint Spring marl of Mississippi, and the Marianna limestone of Alabama. The species differs from *Quinqueloculina bicostata* d'Orbigny in the much more elongate form, greater compression, and much deeper depressions between the costae.

QUINQUELOCULINA CRASSA d'Orbigny, var. **MACERATA** Cushman and Todd, n. var.
(Pl. 14, figs. 3, 4)

Quinqueloculina crassa CUSHMAN (not D'ORBIGNY), U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 101, pl. 27, figs. 1, 2; Prof. Paper 133, 1923, p. 52.—APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 9, 1925, p. 24.—CUSHMAN and MCGLAMERY, U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 104, pl. 24, fig. 4.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 550, pl. 72, fig. 4.

Variety differing from the typical form in the more elongate test and more angular chambers.

Holotype of variety (Cushman Coll. No. 46921) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This variety occurs in the Oligocene of Mississippi and Alabama and the Anahuac formation of Texas.

QUINQUELOCULINA MCGLAMERYAE Cushman and Todd, n. sp. (Pl. 13, figs. 22, 23)

Quinqueloculina sp. CUSHMAN and MCGLAMERY, U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 66, pl. 4, fig. 2.

Test small, nearly as broad as long, nearly circular in front view, periphery angled but somewhat rounded; chambers distinct, increasing rather rapidly in size as added; sutures distinct but not depressed; wall with rather few, coarse costae, parallel to the periphery; aperture rounded, with the outer wall of the final chamber somewhat overhanging, usually without a definite apertural tooth. Maximum length 0.50 mm.; breadth 0.40 mm.; thickness 0.30 mm.

Holotype (Cushman Coll. No. 46923) from the Oligocene, Byram marl, Pearl River, at Byram, Hinds Co., Miss.

This species differs from *Q. crassa* d'Orbigny in the fewer and coarser costae and more angled periphery. It occurs also in the Chickasawhay marl near Millry, Alabama.

Genus MASSILINA Schlumberger, 1893

MASSILINA CRUSTA Cushman (Pl. 14, fig. 5)

Massilina crusta CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 104, pl. 28, fig. 1; Prof. Paper 133, 1923, p. 55.

The only record for this large species is from the Byram marl. It is a rather unique species and should make a good index fossil. Only a few specimens were found in our Byram material but these are typical.

Genus SPIROLOCULINA d'Orbigny, 1826

SPIROLOCULINA OCCLUSA (Cushman) (Pl. 14, fig. 7)

Massilina oclusa CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 104, pl. 28, fig. 2; Prof. Paper 133, 1923, p. 55.—Howe, Journ. Pal., vol. 2, 1928, p. 175 (list).

EXPLANATION OF PLATE 13

FIG. 1. *Ammobaculites stephensoni* Cushman. $\times 60$. 2. *A. junceus* Cushman and Applin, n. sp. $\times 60$. a, side view; b, apertural view. 3. *A. comprimatus* Cushman and Applin, n. sp. $\times 60$. a, side view; b, apertural view. 4, 5. *A. bergquisti* Cushman and Applin, n. sp. $\times 60$. 4, Holotype. a, side view; b, apertural view. 5, Paratype. 6. *Ammobaculoides plummerae* Loeblich. $\times 60$. a, side view; b, apertural view. 7. *Ammobaculites braunsteini* Cushman and Applin, n. sp. $\times 60$. a, side view; b, apertural view. 8. *Trochammina exigua* Cushman and Applin, n. sp. $\times 60$. a, dorsal view; b, ventral view; c, peripheral view. 9. *T. rainwateri* Cushman and Applin, n. sp. $\times 60$. a, dorsal view; b, ventral view; c, peripheral view. 10. *Spiroplectammina mississippiensis* (Cushman). $\times 40$. 11. *S. mississippiensis* (Cushman), var. *alabamensis* (Cushman). $\times 40$. 12. *S. howei* Stuckey. $\times 40$. 13. *Textularia tumidula* Cushman. $\times 27$. 14. *T. subhauerii* Cushman. $\times 27$. 15. *Gaudryina* (*Siphogaudryina*) *youngi* Howe. $\times 40$. 16, 17. *G. (Siphogaudryina) glabrata* (Cushman). 18. *Quinqueloculina byramensis* Cushman. $\times 40$. 19. *Q. glabrata* Cushman. $\times 40$. 20. *Liebusella byramensis* (Cushman). $\times 27$. 21. *Quinqueloculina vicksburgensis* Cushman. $\times 40$. 22, 23. *Q. mcglameryae* Cushman and Todd, n. sp. $\times 40$. 22, Holotype, a, front view; b, apertural view. 23, Paratype.

(Figures 1-9, from Woodbine formation; 10-23, from Byram marl.)





Spiroloculina occlusa CUSHMAN and TODD, Special Publ. 11, Cushman Lab. Foram. Res., 1944, p. 15, pl. 3, fig. 12.

The types of this species were from the Byram marl of Mississippi and it has been recorded by Howe from the Red Bluff clay of Hiwannee, Miss. It occurs commonly in the present material. The figure of the holotype is reproduced on our plate.

SPIROLOCULINA SPISSA Cushman and Todd (Pl. 14, fig. 6)

Spiroloculina grateloupi CUSHMAN (not d'ORBIGNY), U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 101, pl. 25, fig. 2; Prof. Paper 133, 1923, p. 50.

Spiroloculina spissa CUSHMAN and TODD, Special Publ. 11, Cushman Lab. Foram. Res., 1944, p. 19, pl. 3, figs. 18-21.

This species was described from the Byram marl at the bridge over Pearl River, Byram, Miss. It is known only from the Oligocene of Mississippi. Our specimens are typical and the type figure is reproduced on our plate.

Genus ARTICULINA d'Orbigny, 1826

ARTICULINA ADVENA (Cushman) (Pl. 14, figs. 8, 9)

Vertebralina advena CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 102, pl. 25, figs. 5, 6; Prof. Paper 133, 1923, p. 51.—HOWE, Journ. Pal., vol. 2, 1928, p. 175 (list).—CUSHMAN and HANZAWA, Contr. Cushman Lab. Foram. Res., vol. 13, 1937, p. 44.—CUSHMAN and MCGLAMERY, U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 66, pl. 4, fig. 5.

Articulina advena CUSHMAN, Special Publ. 10, Cushman Lab. Foram. Res., 1944, p. 8, pl. 1, figs. 20, 21.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 552, pl. 72, fig. 9.

EXPLANATION OF PLATE 14

FIGS. 1, 2. *Quinqueloculina monroei* Cushman and Todd, n. sp. × 27. 1, Holotype, *a*, front view; *b*, apertural view. 2, Paratype. 3, 4. *Q. crassa* d'Orbigny, var. *macerata* Cushman and Todd, n. var. × 27. 3, Paratype. 4, Holotype. 5. *Massilina crusta* Cushman. × 27. 6. *Spiroloculina spissa* Cushman and Todd. × 33. Holotype. (After Cushman and Todd). *a*, front view; *b*, apertural view. 7. *S. occlusa* (Cushman). × 65. Holotype. (After Cushman). *a*, front view; *b*, apertural view. 8, 9. *Articulina advena* (Cushman). × 33. (After Cushman). 8, Paratype. 9, Holotype. 10, 11. *A. byramensis* Cushman. × 33. (After Cushman). 10, Holotype. 11, Paratype. 12. *Hauerina byramensis* (Cushman). × 40. (After Cushman). *a*, front view; *b*, detail of surface ornamentation. 13. *Articulina* sp. × 45. 14. *Triloculina sculpturata* Cushman. × 45. 15. *T. mississippiensis* Cushman. × 60. Holotype. (After Cushman). 16, 17. *T. byramensis* Cushman and Todd, n. sp. × 45. 16, Holotype, *a*, front view; *b*, apertural view. 17, Paratype. 18, 19. *Pyrgo byramensis* Cushman and Todd, n. sp. × 40. 18, Holotype, front view. 19, Paratype, apertural view. 20, 21. *P. monroei* Cushman and Todd, n. sp. 20, Holotype, peripheral view. × 45. 21, Paratype, side view. × 40. 22. *Cornuspira byramensis* Cushman. × 45. Holotype. (After Cushman). *a*, side view; *b*, peripheral view. 23. *Robulus vicksburgensis* (Cushman). × 40. 24, 25. *Dentalina pseudoinvolvens* Cushman and McGlamery. × 36. (After Cushman and McGlamery). 26. *D. soluta* Reuss. × 45. 27. *Dentalina* sp. × 45. 28, 29. *Nodosaria praecatesbyi* Cushman and Todd, n. sp. × 40. 28, Holotype. 29, Paratype.

Vertebralina cassis CUSHMAN and PONTON (not d'ORBIGNY), Bull. 9, Florida State Geol. Survey, 1932, p. 57, pl. 8, fig. 1.

The types of this species are from the Byram marl at Byram, Miss., and the figures are reproduced here. The species is recorded from the Oligocene, Byram marl and Red Bluff clay of Mississippi, the Chickasawhay marl of Alabama, the Anahuac formation of Texas, and the Miocene of Florida.

ARTICULINA BYRAMENSIS Cushman (Pl. 14, figs. 10, 11)

Articulina byramensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 103, pl. 27, figs. 5, 6; Prof. Paper 129-F, 1922, p. 143; Prof. Paper 133, 1923, p. 56.—Howe, Journ. Pal., vol. 2, 1928, p. 174 (list).—CUSHMAN and HANZAWA, Contr. Cushman Lab. Foram. Res., vol. 13, 1937, p. 45.—CUSHMAN, Special Publ. 10, Cushman Lab. Foram. Res., 1944, p. 7, pl. 1, figs. 18, 19.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 552, pl. 72, fig. 10.

The types of this species are also from the Oligocene, Byram marl, of Byram, Miss., and the type figures are reproduced here. It also occurs in the Mint Spring marl and seems to be an index fossil for this part of the Oligocene.

ARTICULINA sp. (Pl. 14, fig. 13)

Rare specimens of a more fragile and more compressed *Articulina*, apparently different from the two preceding species, occurred in our material but not enough specimens were found to warrant a description.

Genus HAUERINA d'Orbigny, 1839

HAUERINA BYRAMENSIS (Cushman) (Pl. 14, fig. 12)

Spiroloculina byramensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 101, pl. 25, fig. 4; Prof. Paper 133, 1923, p. 51.—CUSHMAN and McGLAMERY, Prof. Paper 197-B, 1942, p. 66.—CUSHMAN and TODD, Special Publ. 11, Cushman Lab. Foram. Res., 1944, p. 74.

Hauerina byramensis CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 22, 1946, p. 3, pl. 2, fig. 15.

The only records for this species are from the type locality of the Byram marl and from the Chickasawhay marl near Millry, Ala. It is very rare in the present material from Byram but one specimen shows the planispiral chambers in the adult, seeming to show that the species probably belongs in *Hauerina*. The type figure is reproduced on our plate.

HAUERINA cf. **FRAGILLISSIMA** H. B. Brady

A single specimen much like that from the Byram marl referred to Brady's species (Cushman, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 103, pl. 27, fig. 3) was found in our material.

Genus **TRILOCULINA** d'Orbigny, 1826**TRILOCULINA SCULPTURATA** Cushman (Pl. 14, fig. 14)

Triloculina sculpturata CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 143, pl. 33, figs. 4, 5; Prof. Paper 133, 1923, p. 57; Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 40, pl. 7, fig. 2.

This species has a rather unusual ornamentation and should be an index fossil for this part of the Oligocene. It is known only from the Mint Spring marl and Byram marl of Mississippi.

TRILOCULINA MISSISSIPPIENSIS Cushman (Pl. 14, fig. 15)

Triloculina mississippiensis CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 25, pl. 4, fig. 1.

This very highly ornate species has been recorded only from the Byram marl, 4 feet above ledge under expansion bridge on Pearl River, Byram, Miss. The type figure is reproduced on our plate. Several very typical specimens were found in our new material. Such a highly specialized species probably has a short range.

TRILOCULINA BYRAMENSIS Cushman and Todd, n. sp. (Pl. 14, figs. 16, 17)

Triloculina sp. CUSHMAN and MCGLAMERY, U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 104, pl. 24, fig. 5.

Test small, somewhat longer than broad, periphery broadly rounded, tending to become slightly angular at the base; chambers distinct, inflated; sutures distinct, but only slightly depressed; wall smooth, polished; aperture nearly circular, with a distinctly thickened lip and a short, broad tooth with slight expansions at the outer angles. Maximum length 0.40 mm.; breadth 0.30 mm.; thickness 0.22 mm.

Holotype (Cushman Coll. No. 46928) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This small but distinct species differs from *T. alabamensis* Cushman in the more elongate oval form, the more distinct chambers, and the large apertural tooth. It is apparently the same as that referred to above from the Chickasawhay marl from Choctaw Bluff on the Alabama River, Clarke Co., Ala.

TRILOCULINA TRIGONULA (Lamarek)

A single specimen in our material may be referred to this species which has already been recorded from the Byram marl (Cushman, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 105).

Genus **PYRGO** Defrance, 1824**PYRGO BYRAMENSIS** Cushman and Todd, n. sp. (Pl. 14, figs. 18, 19)

Test small, slightly longer than broad, broadly rounded in transverse section, base broadly rounded, apertural end somewhat tapering; cham-

bers distinct, strongly inflated; sutures distinct but only slightly depressed; wall smooth and polished; aperture circular, without a distinct lip, the apertural tooth with a peculiar trilobate form in end view and somewhat rounded in front view. Maximum length 0.60 mm.; breadth 0.45 mm.; thickness 0.35 mm.

Holotype (Cushman Coll. No. 46930) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species differs from *P. oligocenica* Cushman in the smooth test, larger final chamber, and peculiar shape of the apertural tooth.

PYRGO MONROEI Cushman and Todd, n. sp. (Pl. 14, figs. 20, 21)

Test somewhat longer than broad, in front view nearly rectangular, in side view biconvex; chambers distinct, the outer side gently convex, the other two sides flattened or somewhat concave, with the peripheral angles slightly keeled; sutures rather obscure, slightly depressed; wall smooth, except for the peripheral angles, polished; aperture nearly circular, with a slightly thickened border and a tooth with a narrow base and two lateral projections. Maximum length 0.55 mm.; breadth 0.35 mm.; thickness 0.35 mm.

Holotype (Cushman Coll. No. 46932) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species somewhat resembles *Flintia laticoncava* Cushman (Contr. Cushman Lab. For. Res., vol. 11, 1935, p. 26, pl. 4, fig. 3) described from the Byram marl, but differs in the more elongate form, less concave sides, keeled periphery, and different apertural tooth.

Family OPTHALMIDIIDAE

Genus CORNUSPIRA Schultze, 1854

CORNUSPIRA BYRAMENSIS Cushman (Pl. 14, fig. 22)

Cornuspira byramensis CUSHMAN, Contr. Cushman Lab. For. Res., vol. 11, 1935, p. 27, pl. 4, fig. 4.—CUSHMAN and GARRETT, l. c., vol. 15, 1939, p. 79, pl. 13, fig. 8.—CUSHMAN and FRIZZELL, l. c., vol. 19, 1943, p. 83, pl. 14, fig. 4.

This species was described from the Byram marl at Byram, Miss. It has also been recorded from the Oligocene, Lincoln formation, of Washington, and from the Eocene of Wilcox age from Woods Bluff, Ala. The type figure is reproduced on our plate. It is very rare in our material.

Family LAGENIDAE

Genus ROBULUS Montfort, 1808

ROBULUS VICKSBURGENSIS (Cushman) (Pl. 14, fig. 23)

Cristellaria vicksburgensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 130, pl. 31, figs. 6, 7; Prof. Paper 133, 1923, p. 29.—APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 9, 1925, pp. 24, 25.

Robulus vicksburgensis ELLISOR, l. c., vol. 17, No. 11, 1933, pl. 2, fig. 2.—HOWE, Journ. Pal., vol. 16, 1942, p. 268 (list).—APPLIN and JORDAN, l. c., vol. 19, 1945, p. 130 (list).

This species is a characteristic one of the American Oligocene. It occurs in the Glendon limestone of Mississippi and Alabama, the Marianna limestone of Alabama, the Mint Spring marl of Mississippi, and beds of Vicksburg age in Florida and Texas. The species is usually represented in the Byram marl by var. *aperta* Cushman but our specimens from the Byram are of the typical form rather than of the variety.

Genus DENTALINA d'Orbigny, 1826

DENTALINA PSEUDOINVOLVENS Cushman and McGlamery (Pl. 14, figs. 24, 25)

Dentalina pseudoinvolvens CUSHMAN and MCGLAMERY, Contr. Cushman Lab. Foram. Res., vol. 15, 1939, p. 45, pl. 9, figs. 1, 2; U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 67, pl. 4, figs. 8, 9.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 556, pl. 74, fig. 3.

The types of this species are from the Oligocene, Chickasawhay marl, of Alabama and the type figures are reproduced on our plate. It is also recorded from the Anahuac formation of Texas. It is very rare in our Byram marl material.

DENTALINA SOLUTA Reuss (Pl. 14, fig. 26)

The single specimen here figured is the only one found in our Byram material but seems to be typical. The types are from the Oligocene of Germany and it is widely recorded.

DENTALINA sp. (Pl. 14, fig. 27)

Rare specimens, similar to that figured, occur in our material.

Abundant material should give a number of species of *Dentalina* from the rare and fragmentary specimens present in our sample.

Genus NODOSARIA Lamarck, 1812

NODOSARIA PRAECATESBYI Cushman and Todd, n. sp. (Pl. 14, figs. 28, 29)

Nodosaria sp. CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 130, pl. 30, fig. 5. *Nodosaria* cf. *catesbyi* CUSHMAN and MCGLAMERY (not d'ORBIGNY), Prof. Paper 189-D, 1938, p. 105, pl. 24, fig. 10; Prof. Paper 197-B, 1942, p. 67, pl. 4, figs. 13-19.

Test with 3 to 5 chambers, increasing in diameter as added, initial end usually with a single, short spine, the final chamber often slightly longer than the earlier ones; sutures distinct, depressed; wall ornamented with coarse, rounded, longitudinal costae, usually somewhat thickened at the outer end, frequently irregular and sometimes fused in part; aperture terminal, radiate, usually ending in a distinct point. Maximum length 1.50 mm.; breadth 0.48 mm.

Holotype (Cushman Coll. No. 46937) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species differs from *N. catesbyi* d'Orbigny in the larger number of chambers, *N. catesbyi* usually having but two, the tendency of the costae to fuse and increase in width toward the outer end, and the pointed apertural end of the test without a neck.

This was previously recorded under other names from the Mint Spring marl of Mississippi and Chickasawhay marl of Alabama. The species shows some variation in the number and size of the chambers and especially in the costae.

Genus CHRYSALOGONIUM Schubert, 1907

CHRYSALOGONIUM sp. (Pl. 15, figs. 1, 2)

The two incomplete specimens figured belong in this genus, as shown by their apertures. More and better specimens are needed to determine the specific characters with certainty.

Genus LAGENA Walker and Jacob, 1798

LAGENA cf. **STRIATO-PUNCTATA** Parker and Jones

A few very small specimens with the peculiarly ornamented costae characteristic of this species were found in our Byram material.

LAGENA COSTATA (Williamson)

Specimens similar to that figured by Cushman and McGlamery (U. S. Geol. Survey Prof. Paper 189-D, 1938, pl. 24, fig. 12) from the Chickasawhay marl of Alabama occur in our sample.

LAGENA HEXAGONA (Williamson)

A single specimen similar to that figured from the Mint Spring marl of Mississippi (Cushman, U. S. Geol. Survey Prof. Paper 129-F, 1922, pl. 29, fig. 12) was the only one found in our material.

Family POLYMORPHINIDAE

Genus GUTTULINA d'Orbigny, 1839

GUTTULINA BYRAMENSIS (Cushman) (Pl. 15, fig. 3)

Polymorphina byramensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 94, pl. 17, fig. 2; Prof. Paper 129-F, 1922, p. 131; Prof. Paper 133, 1923, p. 31, pl. 5, figs. 1-5.

Guttulina byramensis HOWE, Journ. Pal., vol. 2, 1928, p. 174 (list).—CUSHMAN and STAINFORTH, Special Publ. 14, Cushman Lab. Foram. Res., 1945, p. 32, pl. 4, figs. 25, 26.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 558, pl. 74, fig. 15.

This is a characteristic species of the American Oligocene. The records include the Byram marl of Mississippi, Glendon limestone of Mississippi and Alabama, Marianna limestone of Alabama, Mint Spring marl of Mississippi, Red Bluff clay of Mississippi and Alabama, Anahuac forma-

tion of Texas, and Cipero marl of Trinidad. A few other records are apparently not this species. It is common in our Byram material.

Genus GLOBULINA d'Orbigny, 1839

GLOBULINA GIBBA d'Orbigny

(For references and figure, see these Contributions, vol. 20, 1944, p. 39, pl. 6, fig. 19.)

This very widely distributed species is common in our material.

GLOBULINA INAEQUALIS Reuss

(For references and figure, see these Contributions, vol. 21, 1945, p. 89, pl. 14, fig. 10.)

This is also a very widely ranging species and is common in the Byram material.

GLOBULINA ALABAMENSIS Cushman and McGlamery (Pl. 15, fig. 4)

Globulina alabamensis CUSHMAN and McGLAMERY, Contr. Cushman Lab. Foram. Res., vol. 15, 1939, p. 46, pl. 9, fig. 3; U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 68, pl. 5, figs. 1-4.

The previous records for this species are from the Oligocene, Chickasawhay marl, of Alabama. Typical specimens occur in our Byram material.

Genus PSEUDOPOLYMORPHINA Cushman and Ozawa, 1928

PSEUDOPOLYMORPHINA RUTILA (Cushman) (Pl. 15, fig. 5)

Polymorphina regina H. B. BRADY, PARKER, and JONES, var. *rutila* CUSHMAN, U. S. Geol. Survey Prof. Paper 133, 1923, p. 34, pl. 5, figs. 7, 8.

Pseudopolymorphina rutila CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, Art. 6, 1930, p. 100, pl. 26, fig. 3.—CUSHMAN, Bull. 4, Florida State Geol. Survey, 1930, p. 36, pl. 5, fig. 20.—COLE, Bull. 6, 1931, p. 30, pl. 4, fig. 13.—CUSHMAN and PONTON, Bull. 9, 1932, p. 67.—CUSHMAN and CAHILL, U. S. Geol. Survey Prof. Paper 175-A, 1933, p. 19, pl. 6, fig. 11.—CUSHMAN, Special Publ. 5, Cushman Lab. Foram. Res., 1933, pl. 22, fig. 15; Foraminifera, 3rd Ed., 1940, Key, pl. 22, fig. 15.

The types of this species are from the Byram marl. It is recorded from the Oligocene of Mississippi and from the Miocene and Pliocene of Florida. It is rare in our Byram material.

Genus SIGMOMORPHINA Cushman and Ozawa, 1928

SIGMOMORPHINA SEMITECTA (Reuss), var. TERQUEMIANA (Fornasini)

(For references and figure, see Special Publ. 16, Cushman Lab. Foram. Res., 1946, p. 20, pl. 4, fig. 18.)

This variety is widely recorded, especially in the Eocene. Some of our Byram specimens seem identical.

Genus POLYMORPHINA d'Orbigny, 1826

POLYMORPHINA ADVENA Cushman (Pl. 15, figs. 6, 7)

Polymorphina advena CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 132, pl. 31, fig. 4; Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 41, pl. 7, fig. 5.—

CUSHMAN and OZAWA, Proc. U. S. Nat. Mus., vol. 77, Art. 6, 1930, p. 118, pl. 30, fig. 10.—CUSHMAN and PONTON, Bull. 9, Florida State Geol. Survey, 1932, p. 67, pl. 10, fig. 4.—CUSHMAN, U. S. Geol. Survey Prof. Paper 181, 1935, p. 29, pl. 10, fig. 8.—CUSHMAN and MCGLAMERY, Prof. Paper 189-D, 1938, p. 106, pl. 24, fig. 21.—CUSHMAN and HERRICK, Contr. Cushman Lab. Foram. Res., vol. 21, 1945, p. 61, pl. 10, fig. 5.—CUSHMAN and TODD, Special Publ. 15, Cushman Lab. Foram. Res., 1945, p. 35, pl. 5, fig. 22.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 559, pl. 74, fig. 20.

The type of this species was from the Mint Spring marl of Mississippi and it is recorded from numerous localities ranging in age from upper Eocene to Miocene. Our Byram specimens are typical.

POLYMORPHINA FRONDEA (Cushman)

(For references and figure, see these Contributions, vol. 21, 1945, p. 91, pl. 14, fig. 20.)

The types of this species are also from the Mint Spring marl of Mississippi. It is recorded from all the members of the Vicksburg group and from the Anahuac formation of Texas. There are records also from the upper Eocene of Georgia and Cuba. It is rather rare in our Byram material.

Family NONIONIDAE

Genus NONION Montfort, 1808

NONION AFFINE (Reuss) (Pl. 15, fig. 8)

This is a widely recorded species but some of the records may not refer to the same form. A few specimens from the Byram material seem to be identical. The types are from the Oligocene of Germany.

NONION ADVENUM (Cushman)

(For earlier references and figure, see these Contributions, vol. 21, 1945, p. 61, pl. 10, fig. 9.)—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 560, pl. 75, fig. 1.—CUSHMAN and TODD, Contr. Cushman Lab. Foram. Res., vol. 21, 1945, p. 91, pl. 15, fig. 1.

The types of this species were from the Mint Spring marl of Mississippi. It is widely distributed in the upper Eocene and Oligocene of the Coastal Plain region.

NONION DECORATUM Cushman and McGlamery

Nonion advenum CUSHMAN and MCGLAMERY (part) (not CUSHMAN), U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 106, pl. 24, fig. 23 (not 24).

Nonion decoratum CUSHMAN and MCGLAMERY, Contr. Cushman Lab. Foram. Res., vol. 15, 1939, p. 46, pl. 9, fig. 4; U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 69, pl. 5, fig. 9.

The types of this species are from the Oligocene, Chickasawhay marl, of Alabama and it has not been recorded elsewhere. Our Byram material has typical specimens.

NONION ALABAMENSE Cushman and Todd, n. sp. (Pl. 15, figs. 9, 10)

Test involute, bilaterally symmetrical, somewhat longer than broad,

periphery subacute, sides slightly umbilicate; chambers about 12 in number, later ones distinct, slightly inflated, the inner end projecting slightly into the central depression, broadly triangular in apertural view; sutures distinct, later ones slightly depressed; wall smooth; aperture broad and very low, extending along the base of the final chamber. Length 0.55-0.65 mm.; breadth 0.40-0.45 mm.; thickness 0.30-0.32 mm.

Holotype (Cushman Coll. No. 46945) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species differs from *N. affine* (Reuss) in the triangular apertural view, more elongate form, less open umbilicus, and subacute periphery.

Genus *NONIONELLA* Cushman, 1926

***NONIONELLA HANTKENI* (Cushman and Applin), var. *SPISSA* Cushman**

(For earlier references and figure, see these Contributions, vol. 21, 1945, p. 63, pl. 10, fig. 12.)—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 560, pl. 75, fig. 5.—CUSHMAN and TODD, Contr. Cushman Lab. Foram. Res., vol. 21, 1945, p. 92, pl. 15, fig. 5.

The types of this variety are from the upper Eocene of South Carolina and most of the records are from beds of Jackson age, but it also occurs in the Oligocene of Alabama and Texas. Specimens are fairly common in our Byram material.

***NONIONELLA HANTKENI* (Cushman and Applin), var. *BYRAMENSIS* Cushman and Todd, n. var. (Pl. 15, figs. 11, 12)**

Variety differing from the typical form in the thicker and more angled test, and slightly higher chambers.

Holotype of variety (Cushman Coll. No. 46947) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This variety, while much like the Eocene species, seems distinct in the characters noted above.

***NONIONELLA OLIGOCENICA* Cushman and McGlamery (Pl. 15, fig. 15)**

Nonionella oligocenica CUSHMAN and MCGLAMERY, Contr. Cushman Lab. Foram. Res., vol. 15, 1939, p. 47, pl. 9, fig. 5; U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 69, pl. 5, figs. 10-12.

The types of this species are from the Chickasawhay marl near Millry, Ala. It is common in our Byram material. The type figures are reproduced on our plate.

***NONIONELLA PAUCILOBA* Cushman (Pl. 15, fig. 17)**

Nonionella pauciloba CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 32, pl. 4, fig. 12.

The only previous record for this species is the original one from the Oligocene of Mississippi. It is rare in our Byram material. The type figures are reproduced on our plate.

NONIONELLA CRASSIPUNCTATA Cushman (Pl. 15, fig. 16)

Nonionella crassipunctata CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 31, pl. 4, fig. 11.—PALMER, Mem. Soc. Cubana Hist. Nat., vol. 14, 1940, p. 289, pl. 51, figs. 3, 4.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 560, pl. 75, fig. 3.

The types are from the Oligocene of Mississippi and it has been recorded from the Oligocene, Cojimar formation, of Cuba, and the Anahuac formation of Texas. A single specimen in our Byram material seems to belong here.

NONIONELLA TATUMI Howe (Pl. 15, figs. 13, 14)

Nonionella tatumi HOWE, Journ. Pal., vol. 4, 1930, p. 330, pl. 27, fig. 6.—ELLISOR, Bull. Amer. Assoc. Petr. Geol., vol. 17, No. 11, 1933, pl. 2, fig. 11.—CUSHMAN, U. S. Geol. Survey Prof. Paper 191, 1939, p. 31, pl. 8, fig. 8.—FRANKLIN, Journ. Pal., vol. 18, 1944, p. 313, pl. 46, fig. 23.

This species was described from the Oligocene of Mississippi and has been recorded from the Vicksburg Oligocene of Texas and from the Carapita formation of Venezuela. A few specimens in our Byram material seem to belong to this species.

Family CAMERINIDAE

Genus OPERCULINOIDES Hanzawa, 1935

OPERCULINOIDES ELLISORAE Gravell and Hanna (Pl. 15, fig. 20)

Operculinoides ellisorae GRAVELL and HANNA, Journ. Pal., vol. 11, 1937, p. 522, pl. 60, figs. 1-6.—ELLISOR, Bull. Amer. Assoc. Petr. Geol., vol. 28, No. 9, 1944, pl. 1, figs. 2, 4, 5.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 561.

The types of this species are from the Oligocene of Texas and it is also recorded from the Oligocene of Mississippi. Typical specimens are common in our Byram material.

Family PENEROPLIIDAE

Genus SPIROLINA Lamarck, 1804

SPIROLINA ARRECTA Cushman (Pl. 15, figs. 18, 19)

Spirolina arrecta CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 27, pl. 4, fig. 7.

This species was described from the Byram marl and has not been recorded elsewhere. Several specimens were found in our material.

Family HETEROHELICIDAE

Genus GÜMBELINA Egger, 1899

GÜMBELINA CUBENSIS Palmer

(For references and figure, see Special Publ. 16, Cushman Lab. Foram. Res., 1946, p. 22, pl. 4, fig. 28.)

This species, known from the Oligocene and upper Eocene of Cuba and

from the upper Eocene of Georgia and Alabama, occurs in some numbers in our Byram material.

Genus BOLIVINELLA Cushman, 1927

BOLIVINELLA SUBPECTINATA Cushman

Bolivinella subpectinata CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 34, pl. 5, fig. 8.—HOWE, Journ. Pal., vol. 4, 1930, p. 264, pl. 21, fig. 1.—CUSHMAN and ELLISOR, l. c., vol. 19, 1945, p. 561, pl. 75, fig. 10.

The types of this species are from the Byram marl at Byram, Miss. It is also recorded from the Red Bluff clay of Mississippi and the Anahuac formation of Texas. Typical specimens occur in our Byram material. The type figure is reproduced on our plate.

BOLIVINELLA SUBPECTINATA Cushman, var. INTERRUPTA Howe

Bolivinella subpectinata CUSHMAN, var. *interrupta* HOWE, Journ. Pal., vol. 4, 1930, p. 266, pl. 21, fig. 2.

A few specimens in our material seem to belong to this variety described from the Byram marl and not recorded elsewhere.

Family BULIMINIDAE

Genus BULIMINELLA Cushman, 1911

BULIMINELLA OBTUSATA Cushman (Pl. 15, figs. 21, 22)

Buliminella obtusata CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 42, pl. 7, fig. 8.—CUSHMAN and PARKER, l. c., vol. 13, 1937, p. 39, pl. 4, figs. 8, 9.

This species is known only from the Byram marl at Byram, Miss. A number of typical specimens were found in our material.

BULIMINELLA MADAGASCARIENSIS (d'Orbigny), var. SPICATA Cushman and Parker (Pl. 15, figs. 23, 24)

Buliminella madagascariensis (d'ORBIGNY), var. *spicata* CUSHMAN and PARKER, in Cushman, Bull. 161, U. S. Nat. Mus., pt. 3, 1942, p. 8, pl. 3, figs. 5, 6.

A number of specimens in our Byram marl material seem identical with this variety known hitherto only from the Tropical Pacific. A number of species of foraminifera and other fossils of our Oligocene are found living in the Pacific.

Genus BULIMINA d'Orbigny, 1826

BULIMINA BYRAMENSIS Cushman and Todd, n. sp. (Pl. 15, figs. 25, 26)

Test small, initial end subacute, tapering from the greatest width near the apertural end, triangular in transverse section, the angles rounded, the sides flat or slightly concave; chambers distinct, not inflated; sutures distinct, not depressed; wall smooth, distinctly perforate; aperture elongate, narrow, extending from the base of the apertural face nearly to the apex of the test. Length 0.25-0.30 mm.; breadth 0.15 mm.

Holotype (Cushman Coll. No. 46954) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species differs from *B. subornata* H. B. Brady in not having a basal spine, the test smooth without definite costae, and its much smaller size.

Specimens are fairly common in our Byram material.

BULIMINA (DESINOBLIMINA) cf. AURICULATA Bailey

A very few specimens in our Byram material are very similar to this species now living off our Atlantic coast.

Genus ENTOSOLENIA Ehrenberg, 1848

ENTOSOLENIA MARGINATO-PERFORATA (Seguenza) (Pl. 15, fig. 27)

A few specimens similar to the one figured occur in our Byram material. Many different forms have been referred to this species and these may not be typical.

ENTOSOLENIA HOWEI Cushman and Todd

(For references and figure, see these Contributions, vol. 21, 1945, p. 95, pl. 15, fig. 29.)

This species has been recorded from the Eocene, Cook Mountain formation, of Louisiana and the Moodys marl member of the Jackson formation, of Mississippi. A single specimen from the Byram marl seems identical.

Genus VIRGULINA d'Orbigny, 1826

VIRGULINA VICKSBURGENSIS Cushman (Pl. 15, fig. 28)

Virgulina vicksburgensis CUSHMAN, Special Publ. 6, Cushman Lab. Foram. Res., 1936, p. 48, pl. 7, fig. 6; Special Publ. 9, 1937, p. 12, pl. 2, figs. 7, 8.—CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 107, pl. 25, fig. 9; Prof. Paper 197-B, 1942, p. 70, pl. 5, fig. 22.—HOWE, Journ. Pal., vol. 16, 1942, p. 268 (list).

This is apparently an index fossil for the Oligocene occurring in all the members from the Red Bluff clay to the Byram marl. The types are from the Byram marl at Byram, Miss. It is recorded from Mississippi and Alabama and is frequent in our Byram material.

Genus BOLIVINA d'Orbigny, 1839

BOLIVINA BYRAMENSIS Cushman (Pl. 15, fig. 29)

(For references and figures, see Special Publ. 15, Cushman Lab. Foram. Res., 1945, p. 47, pl. 7, fig. 20 and Special Publ. 9, 1937, p. 69, pl. 8, figs. 18-20.)

This species was described from the Byram marl at Byram, Miss., and has been widely recorded from the American Oligocene and Miocene. Typical specimens are common in our Byram material.

BOLIVINA MISSISSIPPIENSIS Cushman (Pl. 15, fig. 30)

Bolivina mississippiensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 92, pl. 15, fig. 5; Prof. Paper 133, 1923, p. 20.—HOWE, Journ. Pal., vol. 2, 1928, p. 174 (list).—CUSHMAN, Special Publ. 9, Cushman Lab. Foram. Res., 1937, p. 69, pl. 8,

fig. 16.—CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 71, pl. 5, figs. 24, 25.—Howe, Journ. Pal., vol. 16, 1942, p. 267 (list).

This species was also described from the Byram marl at Byram, Miss. It has been recorded only from the Oligocene of Mississippi and Alabama. Typical specimens occur in our Byram material.

BOLIVINA MISSISSIPPIENSIS Cushman, var. **COSTIFERA** Cushman (Pl. 15, fig. 31)

Bolivina mississippiensis CUSHMAN, var. *costifera* CUSHMAN, Special Publ. 6, Cushman Lab. Foram. Res., 1936, p. 51, pl. 7, fig. 15; Special Publ. 9, 1937, p. 69, pl. 8, fig. 17.

This costate variety is known only from the Byram marl at Byram, Miss. The type figure is reproduced on our plate. A few specimens occur in our material.

BOLIVINA CHOCTAWENSIS Cushman and McGlamery (Pl. 15, fig. 32)

Bolivina choctawensis CUSHMAN and McGLAMERY, in Cushman, Special Publ. 9, Cushman Lab. Foram. Res., 1937, p. 72, pl. 8, fig. 24; U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 108, pl. 26, fig. 4; Prof. Paper 197-B, 1942, p. 71.

The only previous records are from the Oligocene of Alabama and the type figure is reproduced on our plate. A few typical specimens occur in our Byram material.

BOLIVINA MORNHINVEGI Cushman (Pl. 15, fig. 33)

Bolivina mornhinvegi CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 32, pl. 5, fig. 1; Special Publ. 9, Cushman Lab. Foram. Res., 1937, p. 70, pl. 8, fig. 21.—CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 108, pl. 25, fig. 17; Prof. Paper 197-B, 1942, p. 71.

This species is known only from the Oligocene of Mississippi and Alabama. The type figure is reproduced on our plate. The specimens from our Byram material are very typical.

BOLIVINA JACKSONENSIS Cushman and Applin

(For references and figure, see these Contributions, vol. 21, 1945, p. 95, pl. 15, fig. 14.)

This is a widely distributed species in the upper Eocene and Oligocene. Typical specimens occur in our Byram material.

Genus LOXOSTOMUM Ehrenberg, 1854

LOXOSTOMUM VICKSBURGENSE (Howe) (Pl. 15, fig. 34)

Pleurostomella vicksburgensis HOWE, Journ. Pal., vol. 4, 1930, p. 331, pl. 27, fig. 5.

Loxostoma vicksburgense CUSHMAN, Special Publ. 9, Cushman Lab. Foram. Res., 1937, p. 179, pl. 21, fig. 5.—CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 108, pl. 26, figs. 6-8; Prof. Paper 197-B, 1942, p. 71, pl. 5, fig. 28.

The types of this unique species are from the Byram marl at Byram, Miss. It is also recorded from the Chickasawhay marl near Millry, Ala. It is apparently an index fossil for this part of the Oligocene. The figure given on our plate is of a specimen from Byram, Miss. It is rare in the present material.

Genus *BIFARINA* Parker and Jones, 1872*BIFARINA VICKSBURGENSIS* (Cushman) (Pl. 16, fig. 1)

(For references and figures, see Special Publ. 9, Cushman Lab. Foram. Res., 1937, p. 198, pl. 22, figs. 29-33.)

This index fossil for the Oligocene is recorded from Mississippi, Texas, Mexico, and Cuba. Typical specimens occur in our Byram material.

Genus *BITUBULOGENERINA* Howe, 1934*BITUBULOGENERINA APERTA* (Cushman) (Pl. 16, fig. 2)

(For references and figure, see Special Publ. 9, Cushman Lab. Foram. Res., 1937, p. 212, pl. 24, fig. 13.)

This is another index fossil for the Oligocene. The types are from the Byram marl and it is also recorded from the Red Bluff clay of Mississippi. It is rare in our material.

BITUBULOGENERINA VICKSBURGENSIS Howe (Pl. 16, fig. 3)

(For references and figures, see Special Publ. 9, Cushman Lab. Foram. Res., 1937, p. 212, pl. 24, figs. 9, 10.)

Another index fossil for the Oligocene, this species is only known from the Mint Spring and Byram marls of Mississippi. A single very typical specimen was found in our Byram material.

Genus *REUSSELLA* Galloway, 1933*REUSSELLA OLIGOCENICA* Cushman and Todd, n. sp. (Pl. 16, figs. 6, 7)

Test small, elongate, 2 to 3 times as long as wide, sides nearly parallel except near the base which is bluntly pointed, apertural end rounded, triangular in transverse section, sides flat, angles subacute; chambers distinct, not inflated; sutures distinct, not depressed; wall smooth; aperture a small, semicircular opening at the base of the last-formed chamber. Length 0.25-0.38 mm.; breadth 0.12 mm.

Holotype (Cushman Coll. No. 46959) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species differs from *R. rectimargo* (Cushman) in the more slender test with nearly parallel sides, rounded aperture, and broad apertural end.

REUSSELLA BYRAMENSIS Cushman and Todd, n. sp. (Pl. 16, figs. 4, 5)

Test slightly longer than broad, tapering to a point at the initial end which occasionally has a slight spine, triangular in transverse section, sides flat or slightly concave, angles acute; chambers not inflated, distinct; sutures distinct, of clear shell material, not depressed; wall smooth; aperture slightly elongate, at the base of the last-formed chamber. Length 0.30-0.35 mm.; breadth 0.20-0.25 mm.

Holotype (Cushman Coll. No. 46957) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species differs from *R. rectimargo* (Cushman) in the shorter, broader form, more regular increase in diameter throughout, and more pointed or even spinose base. It is fairly common in our material.

Genus **ANGULOGERINA** Cushman, 1927

ANGULOGERINA BYRAMENSIS (Cushman)

(For figures and earlier references, see these Contributions, vol. 14, 1938, p. 87, pl. 15, figs. 18, 19.)—ELLISOR, Bull. Amer. Assoc. Petr. Geol., vol. 24, No. 3, 1940, pl. 1, fig. 6.—CUSHMAN and MCGLAMERY, U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 72, pl. 6, figs. 4-10.—HOWE, Journ. Pal., vol. 16, 1942, p. 267 (list).—ELLISOR, Bull. Amer. Assoc. Petr. Geol., vol. 28, No. 9, 1944, pl. 7, fig. 6.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 567, pl. 76, fig. 11.

The types are from the Byram marl at Byram, Miss., and the species is recorded also from the Oligocene of Alabama, Texas, and Mexico, and from the Miocene of Louisiana. It is abundant in our Byram material.

ANGULOGERINA VICKSBURGENSIS Cushman

(For references and figure, see these Contributions, vol. 21, 1945, p. 67, pl. 10, fig. 27.)

This species was also described from the Byram marl at Byram, Miss., and is recorded from the Oligocene of Alabama and Cuba as well as from the upper Eocene of Georgia and Cuba. It is fairly common in our material.

ANGULOGERINA RUGOPLICATA Cushman

(For references and figure, see these Contributions, vol. 14, 1938, p. 88, pl. 15, fig. 20.)
—HOWE, Journ. Pal., vol. 16, 1942, p. 267 (list).

The only records for this species are from the Oligocene of Mississippi and Alabama. A single specimen in our material seems to belong here.

Family **ROTALIIDAE**

Genus **SPIRILLINA** Ehrenberg, 1841

SPIRILLINA LIMBATA H. B. Brady, var. **BIPUNCTATA** Cushman

Spirillina limbata H. B. BRADY, var. *bipunctata* CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 134, pl. 32, figs. 3-5; Prof. Paper 133, 1923, p. 36.—HOWE, Journ. Pal., vol. 2, 1928, p. 175 (list).

This variety is recorded from the Byram marl, Mint Spring marl, and Red Bluff clay of Mississippi and should make an index fossil for this part of the Oligocene. A single specimen was found in our material.

SPIRILLINA SUBDECORATA Cushman (Pl. 16, fig. 10)

Spirillina subdecorata CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 95, pl. 19, figs. 4, 5; Prof. Paper 133, 1923, p. 37.

The types are from the Byram marl at Byram, Miss., and it has not been recorded elsewhere. Only a few specimens were found in our Byram material.

SPIRILLINA VICKSBURGENSIS Cushman (Pl. 16, fig. 11)

Spirillina vicksburgensis CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 34, pl. 5, fig. 6.

The only Oligocene record for this species is that of its type locality at Byram, Miss. Specimens referred questionably to this species from the upper Eocene, McBean formation, of Georgia are the only others recorded. It is rare in our Byram material. The type figures are reproduced on our plate.

Genus DISCORBIS Lamarck, 1804**DISCORBIS SUBGLOBOSA** Cushman (Pl. 16, fig. 8)

Discorbis subglobosa CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 38, pl. 5, fig. 8.

The only record for this species is its type locality in the Byram marl at Byram, Miss. The type figure is reproduced on our plate. Several typical specimens were found in our Byram material.

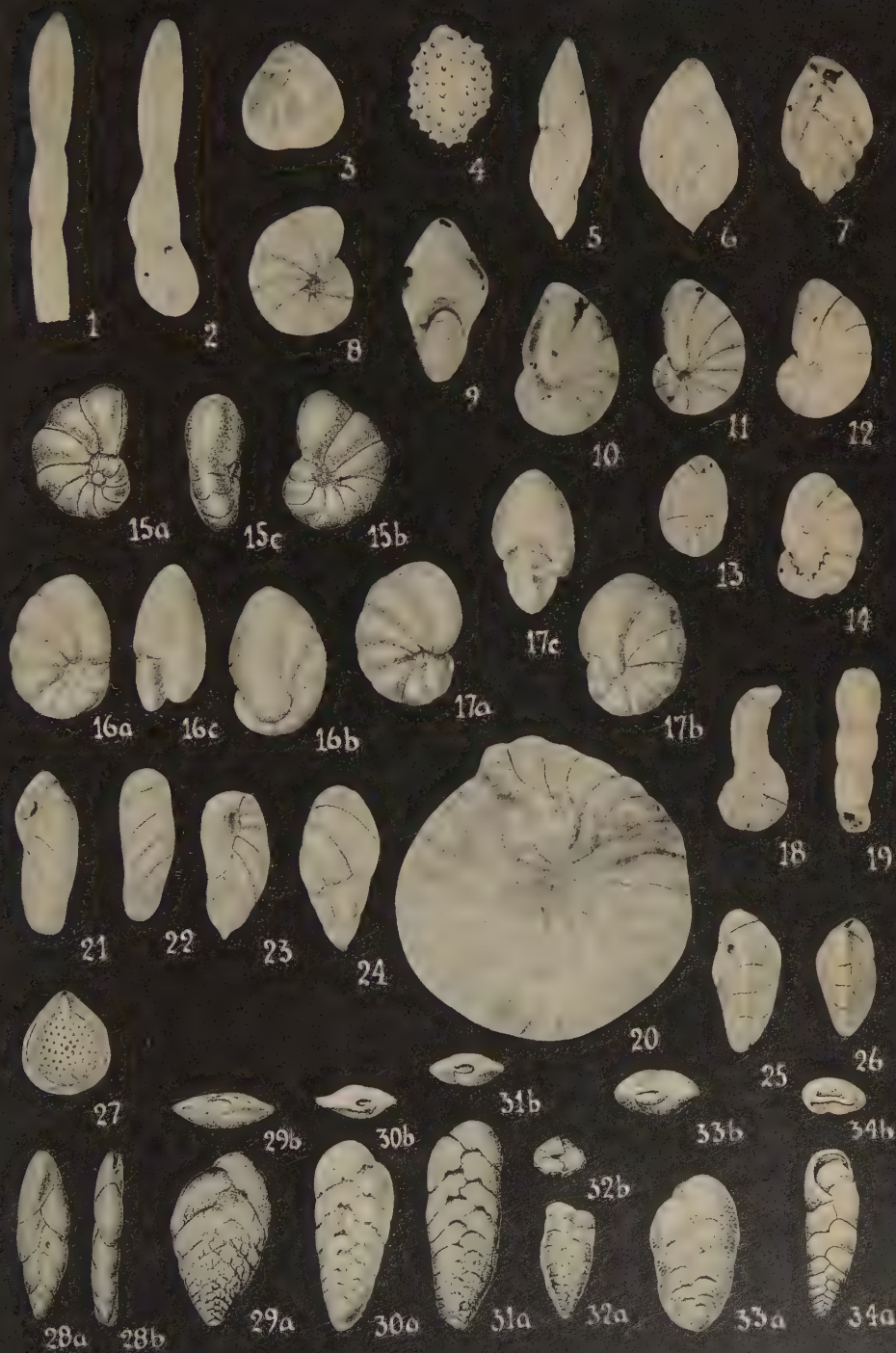
DISCORBIS ARCUATO-COSTATA Cushman (Pl. 16, fig. 15)

Discorbis arcuato-costata CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 38, pl. 5, fig. 9.

The types of this species are from the Oligocene of Mississippi and

EXPLANATION OF PLATE 15

- FIGS. 1, 2. *Chrysalogonium* sp. $\times 45$. 3. *Guttulina byramensis* (Cushman). $\times 40$. 4. *Globulina alabamensis* Cushman and McGlamery. $\times 40$. 5. *Pseudopolymorphina rutila* (Cushman). $\times 45$. 6, 7. *Polymorphina advena* Cushman. $\times 45$. 8. *Nonion affine* (Reuss). $\times 45$. 9, 10. *N. alabamense* Cushman and Todd, n. sp. $\times 40$. 9, Paratype, apertural view. 10, Holotype, side view. 11, 12. *Nonionella hantkeni* (Cushman and Applin), var. *byramensis* Cushman and Todd, n. var. $\times 40$. 11, Holotype. 12, Paratype. 13, 14. *N. tatumi* Howe. $\times 45$. 13, Dorsal view. 14, Ventral view. 15. *N. oligocenica* Cushman and McGlamery. $\times 45$. Holotype (After Cushman and McGlamery). *a*, *b*, opposite sides; *c*, apertural view. 16. *N. crassipunctata* Cushman. $\times 75$. Holotype. (After Cushman). *a*, *b*, opposite sides; *c*, apertural view. 17. *N. pauciloba* Cushman. $\times 75$. Holotype (After Cushman). *a*, *b*, opposite sides; *c*, apertural view. 18, 19. *Spirolina arrecta* Cushman. $\times 70$. 18, Specimen showing early coils. 19, Specimen showing apertural end. 20. *Operculinoides ellisorae* Gravell and Hanna. $\times 20$. 21, 22. *Buliminella obtusata* Cushman. $\times 70$. 21, Apertural view. 22, Dorsal view. 23, 24. *B. madagascariensis* (d'Orbigny), var. *spicata* Cushman and Parker. $\times 70$. 23, Apertural view. 24, Dorsal view. 25, 26. *Bulimina byramensis* Cushman and Todd, n. sp. $\times 70$. 25, Holotype. 26, Paratype. 27. *Entosolenia marginato-perforata* (Seguenza). $\times 45$. 28. *Virgulina vicksburgensis* Cushman. $\times 55$. Holotype. (After Cushman). *a*, front view; *b*, side view. 29. *Bolivina byramensis* Cushman. $\times 55$. Paratype. (After Cushman). *a*, front view; *b*, apertural view. 30. *B. mississippiensis* Cushman. $\times 80$. Paratype. (After Cushman). *a*, front view; *b*, apertural view. 31. *B. mississippiensis* Cushman, var. *costifera* Cushman. $\times 105$. (After Cushman). *a*, front view; *b*, apertural view. 32. *B. choctawensis* Cushman and McGlamery. $\times 60$. Holotype. (After Cushman and McGlamery). *a*, front view; *b*, apertural view. 33. *B. mornhinzei* Cushman. $\times 75$. Holotype. (After Cushman). *a*, front view; *b*, apertural view. 34. *Loxostomum vicksburgense* (Howe). $\times 70$. (After Cushman). *a*, front view; *b*, apertural view.





there are no other records. A single very typical specimen was found in our material. The type figure is copied.

DISCORBIS cf. ORBICULARIS (Terquem)

A few specimens in our Byram material resemble the Oligocene specimens from the Byram marl referred to this species (Cushman, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 96, pl. 19, figs. 9, 10).

DISCORBIS OLIGOCENICA Cushman and Todd, new name (Pl. 16, figs. 9, 14)

Truncatulina byramensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 96, pl. 20, figs. 4-6; Prof. Paper 129-F, 1922, p. 136; Prof. Paper 133, 1923, p. 41.

The types of this species are from the Byram marl at Byram, Miss., and it is recorded from the Glendon limestone of Mississippi, the Marianna limestone of Alabama and Florida, and the Mint Spring marl of Mississippi. It is fairly common in our material. As there is already a *Discorbis byramensis*, the specific name *oligocenica* is proposed for this species.

DISCORBIS cf. ASSULATA Cushman

A few specimens in our Byram material resemble this species, characteristic of the upper Eocene.

Genus LAMARCKINA Berthelin, 1880

LAMARCKINA GLABRATA (Cushman)

Pulvinulina glabrata CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 99, pl. 22,

EXPLANATION OF PLATE 16

FIG. 1. *Bifarina vicksburgensis* (Cushman). $\times 75$. (After Cushman). 2. *Bitubulogenerina aperta* (Cushman). $\times 100$. Holotype. (After Cushman). a, front view; b, apertural view. 3. *B. vicksburgensis* Howe. $\times 100$. (After Howe). a, front view; b, apertural view. 4, 5. *Reussella byramensis* Cushman and Todd, n. sp. $\times 70$. 4, Holotype. 5, Paratype. 6, 7. *R. oligocenica* Cushman and Todd, n. sp. $\times 70$. 6, Holotype. 7, Paratype. 8. *Discorbis subglobosa* Cushman. $\times 75$. Holotype (After Cushman). a, dorsal view; b, ventral view; c, peripheral view. 9, 14. *D. oligocenica* Cushman and Todd, new name. $\times 27$. 10. *Spirillina subdecorata* Cushman. $\times 70$. 11. *S. vicksburgensis* Cushman. $\times 75$. Holotype. (After Cushman). a, b, opposite sides; c, peripheral view. 12, 13. *Lamarckina byramensis* Cushman and Todd, n. sp. $\times 40$. 12, Holotype, dorsal view. 13, Paratype, ventral view. 15. *Discorbis arcuato-costata* Cushman. $\times 60$. Holotype. (After Cushman). a, dorsal view; b, ventral view; c, peripheral view. 16. *Valvulineria paucilocula* Cushman. $\times 60$. Holotype. (After Cushman). a, dorsal view; b, ventral view; c, peripheral view. 17, 18. *Eponides byramensis* (Cushman). $\times 27$. 17, Ventral view. 18, Dorsal view. 19-21. *Gyroïdina byramensis* Cushman and Todd, n. sp. 19, Holotype, ventral view. $\times 70$. 20, Paratype, dorsal view. $\times 70$. 21, Paratype, apertural view. $\times 40$. 22. *Eponides alabamensis* Cushman and McGlamery. $\times 45$. 23. *Rotalia byramensis* Cushman. $\times 40$. 24, 25. *R. parva* Cushman. $\times 70$. 24, Ventral view. 25, Dorsal view. 26. *Mississippiina monsouiri* Howe. $\times 45$. a, dorsal view; b, ventral view; c, peripheral view. 27. *Asterigerina subacuta* Cushman. $\times 45$. 28, 29. *A. byramensis* Cushman and Todd, n. sp. $\times 27$. 28, Paratype, ventral view. 29, Holotype, dorsal view. 30-32. *Cibicides vicksburgensis* (Cushman). $\times 40$. 30, Dorsal view. 31, Ventral view. 32, Peripheral view.

figs. 6, 7; Prof. Paper 129-F, 1922, p. 138; Prof. Paper 133, 1923, p. 45, pl. 6, figs. 11, 12.

Lamarckina glabrata CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 2, pt. 1, 1926, p. 11, pl. 1, fig. 6.—HOWE, Journ. Pal., vol. 2, 1928, p. 175 (list).—CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 109, pl. 26, fig. 17; Prof. Paper 197-B, 1942, p. 73.

This characteristic Vicksburg species, known from Mississippi and Alabama, occurs in our Byram material.

LAMARCKINA BYRAMENSIS Cushman and Todd, n. sp. (Pl. 16, figs. 12, 13)

Test nearly as wide as long, thick, ventral side strongly convex near the borders and deeply umbilicate at the center, periphery of the early portion acute and keeled, later portion broadly rounded; chambers distinct on the dorsal side, indistinct on the ventral side, increasing rapidly in size as added, the earlier ones on the dorsal side concave, later ones strongly convex; sutures on the dorsal side fairly distinct, on the ventral side indistinct; wall of the ventral side smooth and polished, dorsally with short, blunt spines over the entire surface; aperture at the ventral side of the last-formed chamber opening into the deep umbilicus. Length 0.38-0.50 mm.; breadth 0.35-0.40 mm.; thickness 0.22-0.28 mm.

Holotype (Cushman Coll. No. 46962) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species differs from *L. glabrata* (Cushman) in the thicker and shorter test, more convex ventral side, and spinose dorsal side. It is common in our Byram material. In some respects it resembles *L. erinacea* (Karrer) from the Miocene of Europe.

Genus VALVULINERIA Cushman, 1926

VALVULINERIA PAUCILOCUA Cushman (Pl. 16, fig. 16)

Valvulineria paucilocula CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 11, 1935, p. 37, pl. 5, fig. 7.—GALLOWAY and HEMINWAY, New York Acad. Sci., Sci. Survey Porto Rico and Virgin Ids., vol. 3, pt. 4, 1941, p. 371, pl. 16, fig. 4.—CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 73, pl. 6, fig. 19.—CUSHMAN and ELLISOR, Journ. Pal., vol. 19, 1945, p. 568, pl. 77, figs. 4, 5.

The types of this species are from the Byram marl, at Byram, Miss. It is also recorded from the Oligocene of Alabama, Texas, and Porto Rico. Typical specimens occur in our Byram material. The type figures are copied on our plate.

Genus GYROIDINA d'Orbigny, 1826

GYROIDINA BYRAMENSIS Cushman and Todd, n. sp. (Pl. 16, figs. 19-21)

Gyroidina sp. CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 73, pl. 6, fig. 20.

Test small, periphery broadly rounded, dorsal side flattened and some-

what concave, ventral side convex, umbilicus very slightly developed; chambers about 6 in the adult whorl, increasing gradually in size as added, distinctly inflated; sutures distinct, depressed; wall smooth and polished, translucent; aperture ventral, extending to the umbilicus, low. Length 0.35-0.40 mm.; breadth 0.25-0.30 mm.; thickness 0.20-0.25 mm.

Holotype (Cushman Coll. No. 46964) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species has already been figured from the Chickasawhay marl of Alabama in the above reference. It differs from *G. soldanii* d'Orbigny, var. *octocamerata* Cushman and G. D. Hanna in the fewer chambers and lack of a definite umbilicus.

Genus EPONIDES Montfort, 1808

EPONIDES BYRAMENSIS (Cushman) (Pl. 16, figs. 17, 18)

Pulvinulina byramensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 99, pl. 22, figs. 4, 5; Prof. Paper 129-F, 1922, p. 138; Prof. Paper 133, 1923, p. 44.

Eponides byramensis HOWE, Journ. Pal., vol. 2, 1928, p. 174 (list).—COLE, Bull. Amer. Pal., vol. 15, No. 57a, 1929, p. 4 (list).—COLE and GILLESPIE, l. c., No. 57b, 1930, p. 12, pl. 2, figs. 1, 2.—COLE and PONTON, Bull. 5, Florida State Geol. Survey, 1930, p. 41, pl. 8, figs. 5, 6.—NUTTALL, Journ. Pal., vol. 6, 1932, p. 26.—PIJPERS, Geol. Pal. Bonaire, 1933, p. 70.—HEDBERG, Journ. Pal., vol. 11, 1937, p. 679, pl. 92, fig. 2.—BERMUDEZ, Mem. Soc. Cubana Hist. Nat., vol. 12, 1938, p. 6.—CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 197-B, 1942, p. 73, pl. 6, fig. 22.—HOWE, Journ. Pal., vol. 16, 1942, p. 267 (list).—FRANKLIN, l. c., vol. 18, 1944, p. 316, pl. 47, fig. 10.—APPLIN and JORDAN, l. c., vol. 19, 1945, p. 130 (list).

The types of this species are from the Byram marl at Byram, Miss. It is found in all the divisions of the Oligocene of the Gulf Coastal Plain and in the Oligocene of Mexico and Venezuela. It is also recorded from the upper Eocene of Cuba and Bonaire. Specimens are very common in our Byram material.

EPONIDES ALABAMENSIS Cushman and McGlamery (Pl. 16, fig. 22)

Eponides alabamensis CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 110, pl. 27, fig. 2; Prof. Paper 197-B, 1942, p. 74, pl. 7, fig. 1.

The types of this species are from the Oligocene of Choctaw Bluff, Ala., and it also occurs in the Chickasawhay marl, near Millry, Ala. A few specimens in our material from Byram, Miss., are identical with the types.

EPONIDES CHOCTAWENSIS Cushman and McGlamery

Eponides choctawensis CUSHMAN and McGLAMERY, U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 110, pl. 27, fig. 1; Prof. Paper 197-B, 1942, p. 74.

This species is recorded from the same localities as *E. alabamensis*. A single specimen in our Byram material seems to belong here.

Genus **ROTALIA** Lamarck, 1804**ROTALIA BYRAMENSIS** Cushman (Pl. 16, fig. 23)

Rotalia byramensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 99, pl. 23, fig. 1; Prof. Paper 129-F, 1922, p. 138; Prof. Paper 133, 1923, p. 46.—CUSHMAN and McGLAMERY, Prof. Paper 189-D, 1938, p. 110, pl. 27, fig. 3; Prof. Paper 197-B, 1942, p. 74.—APPLIN and APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 28, No. 12, 1944, pl. 1, fig. 1.—APPLIN and JORDAN, Journ. Pal., vol. 19, 1945, p. 129 (list); p. 142.

The types of this distinctive species are from the Byram marl at Byram, Miss. It is also recorded from the Mint Spring marl of Mississippi, the Chickasawhay marl of Alabama, and the Suwannee limestone of Florida. A few other records are questionable. It is a common species in our Byram material.

ROTALIA PARVA Cushman (Pl. 16, figs. 24, 25)

Rotalia dentata PARKER and JONES, var. *parva* CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 139, pl. 35, figs. 1, 2; Prof. Paper 133, 1923, p. 47.—HOWE, Journ. Pal., vol. 2, 1928, p. 175 (list).—ELLISOR, Bull. Amer. Assoc. Petr. Geol., vol. 17, No. 11, 1933, pl. 4, fig. 3.

This characteristic form seems to be a distinct species and an index fossil for the American Oligocene. The types are from the Mint Spring marl of Mississippi and it is recorded from the Byram marl, Marianna limestone, and Red Bluff clay of Mississippi, and the Oligocene of Texas. It is fairly common in our Byram material.

Genus **MISSISSIPPINA** Howe, 1930**MISSISSIPPINA MONSOURI** Howe (Pl. 16, fig. 26)

Mississippina monsourei HOWE, Journ. Pal., vol. 4, 1930, p. 330, pl. 27, fig. 4.—CUSHMAN, Special Publ. 5, Cushman Lab. Foram. Res., 1933, pl. 31, fig. 1; Foraminifera, 3rd Ed., 1940, Key, pl. 31, fig. 1.—BROTZEN, Sver. Geol. Under., ser. C, No. 451, 1942, p. 36, fig. [pl.] 12, fig. 3.

This species is known only from the Oligocene of Mississippi. A few typical specimens were found in our Byram material and it should make a good index fossil for the Oligocene.

Genus **SIPHONINA** Reuss, 1850**SIPHONINA ADVENA** Cushman

This species was originally described from the Byram marl at Byram, Miss. It is common in our material. There are numerous records for it in the Oligocene of Mississippi, Alabama, Florida, Texas, Mexico, Cuba, and Porto Rico.

Genus **CANCRI** Montfort, 1808**CANCRI PAUCILOCULATUS** Cushman and McGlamery

(For references and figure, see these Contributions, vol. 18, 1942, p. 85, pl. 22, fig. 4.)

The types of this species are from the Oligocene, Chickasawhay marl,

of Alabama. It occurs in other parts of the Oligocene of Mississippi, Alabama, and Florida. It is very rare in our Byram material.

Family AMPHISTEGINIDAE

Genus ASTERIGERINA d'Orbigny, 1839

ASTERIGERINA SUBACUTA Cushman (Pl. 16, fig. 27)

Asterigerina subacuta CUSHMAN, U. S. Geol. Survey Prof. Paper 129-E, 1922, p. 100, pl. 24, figs. 1-3; Prof. Paper 133, 1923, p. 47.—COLE and GILLESPIE, Bull. Amer. Pal., vol. 15, No. 57b, 1930, p. 13.—CUSHMAN and MCGLAMERY, U. S. Geol. Survey Prof. Paper 189-D, 1938, p. 111, pl. 28, fig. 1.—HOWE, Journ. Pal., vol. 16, 1942, p. 267 (list).

This species was described from the Byram marl at Byram, Miss. It seems to be an index fossil for the Oligocene, being recorded from Mississippi, Alabama, and Mexico. Typical specimens are fairly common in our Byram material.

ASTERIGERINA BYRAMENSIS Cushman and Todd, n. sp. (Pl. 16, figs. 28, 29)

Test of medium size for the genus, biconvex, periphery acute and slightly keeled, ventral side slightly umbonate, dorsal side usually transparent in the center showing earlier whorls; chambers distinct, 8-10 in the adult whorl, not inflated, increasing very gradually in size as added; sutures distinct, not depressed, the spiral suture on the dorsal side very distinct; wall smooth; aperture on the ventral side at the base of the last-formed chamber, low. Maximum diameter 1.15 mm.; thickness 0.45 mm.

Holotype (Cushman Coll. No. 46973) from the Oligocene, Byram marl, Pearl River at Byram, Hinds Co., Miss.

This species differs from *A. alabamensis* Cushman and McGlamery in the more evenly biconvex shape, more distinct keel, shorter chambers, and less curved sutures, and the very clearly marked spiral suture.

Family CASSIDULINIDAE

Genus CASSIDULINA d'Orbigny, 1826

CASSIDULINA MOODYSENSIS Cushman and Todd

Cassidulina moodyensis CUSHMAN and TODD, Contr. Cushman Lab. Foram. Res., vol. 21, 1945, p. 102, pl. 16, figs. 9, 10.

Numerous specimens of a small species in our Byram material seem identical with this species from the upper Eocene, Moodys marl member of the Jackson formation, Jackson, Miss.

Family ANOMALINIDAE

Genus CIBICIDES Montfort, 1808

CIBICIDES LOBATULUS (Walker and Jacob)

A number of specimens in our Byram material are similar to the Oligocene specimens referred to this widely recorded species.

CIBICIDES MISSISSIPPIENSIS (Cushman)

(For references and figures, see Special Publ. 16, Cushman Lab. Foram. Res., 1946, p. 39, pl. 8, figs. 5, 6.)

This species is widely distributed in the Oligocene and upper Eocene of the Coastal Plain region of the United States. The types are from the Byram marl at Byram, Miss., and it is common in our material.

CIBICIDES AMERICANUS (Cushman)

This species has been widely recorded and, from the figures, more than one species has been included under this name. Our specimens are similar to those figured from the Oligocene, Anahuac formation, of Texas (Cushman and Ellisor, Journ. Pal., vol. 19, 1945, p. 571, pl. 78, fig. 7).

CIBICIDES VICKSBURGENSIS (Cushman) (Pl. 16, figs. 30-32)

Rotalia vicksburgensis CUSHMAN, U. S. Geol. Survey Prof. Paper 129-F, 1922, p. 139, pl. 35, figs. 3, 4; Prof. Paper 133, 1923, p. 46.—APPLIN, Bull. Amer. Assoc. Petr. Geol., vol. 9, 1925, p. 25.—NUTTALL, Journ. Pal., vol. 6, 1932, p. 25, pl. 4, figs. 8, 9.

This species originally referred to *Rotalia* is really a *Cibicides*. It has been recorded from various members of the Oligocene and also from the Oligocene of Mexico. It is fairly common in our Byram material.

CIBICIDES YAZOOENSIS Cushman ..

(For references and figures, see these Contributions, vol. 21, 1945, p. 104, pl. 16, figs. 16, 17.)

A few specimens in our Byram material seem very similar to this species recorded from the upper Eocene of Alabama, Mississippi, and Texas.

CIBICIDES PLANO-CONVEXUS Cushman and Todd

Cibicides plano-convexa CUSHMAN and TODD, Contr. Cushman Lab. Foram. Res., vol. 21, 1945, p. 104, pl. 16, figs. 18, 19.

A few specimens in our Byram material are much like this species from the Moodys marl member of the Jackson formation of Mississippi.

Family PLANORBULINIDAE

Genus PLANORBULINELLA Cushman, 1927

PLANORBULINELLA cf. LARVATA (Parker and Jones)

A number of specimens in our Byram material seem to belong to this species which has been very widely recorded from Eocene to Recent.

281. *SIGMOILINA VICTORIENSIS* CUSHMAN, A NEW NAME

BY JOSEPH A. CUSHMAN

In the previous number of these Contributions a new variety, *Sigmoilina sigmoidea* (H. B. Brady), var. *compressa* Cushman, was described (p. 32, pl. 5, figs. 10-12). Dr. Hans Thalmann has called my attention to the fact that Gherke had used the name *compressa* for a variety of his species *Sigmoilina tchokrakensis*. The following name is therefore proposed:

SIGMOILINA VICTORIENSIS Cushman, new name

Sigmoilina sigmoidea CHAPMAN (not H. B. BRADY), Journ. Linn. Soc. Zool., vol. 30, 1907, p. 20, pl. 2, fig. 40.—HERON-ALLEN and EARLAND, Journ. Roy. Micr. Soc., 1924, p. 133.—CRESPIN, Bull. 9 (Pal. Ser. No. 4), Commonwealth of Australia, Min. Res. Survey, (mimeographed), 1943, p. 83 (list).

Sigmoilina sigmoidea (H. B. BRADY), var. *compressa* CUSHMAN (not GHERKE), Contr. Cushman Lab. Foram. Res., vol. 22, 1946, p. 32, pl. 5, figs. 10-12.

Test very much compressed, periphery acute; chambers distinct, two in the final coil; wall smooth; aperture at the periphery with a slightly overhanging projection of the periphery. Length 0.70-0.92 mm.; breadth 0.65-0.80 mm.; thickness 0.24-0.36 mm.

Holotype (Cushman Coll. No. 46243) from the Oligocene, Balcombian, of Grice's Creek, Victoria, Australia.

Specimens also occur in the Balcombian of Muddy Creek, and the Janjukian, Green marl, Bird Rock Cliffs, Torquay, Victoria, Australia.

In comparison with Recent material of Brady's species, this one from Australia seems to be a distinct species. The test is much more compressed and the periphery much more acute.

RECENT LITERATURE ON THE FORAMINIFERA

Below are given some of the more recent works on the foraminifera that have come to hand:

di Napoli Alliata, E. I Foraminiferi di un nuovo giacimento del piano Siciliana nei dintorni di Palermo.—Boll. Soc. Sci. Nat. ed Econ. di Palermo, vol. XIX, Anno 1936-37, pp. 1-16.—A large foraminiferal fauna is recorded, none new.

Contributo alla conoscenza dei Foraminiferi pleistocenici della Conca d'Oro (Palermo).—Boll. Soc. Geol. Ital., vol. LVI, fasc. 3, 1937, pp. 409-424.—Numerous species are listed and notes given on the faunas.

Sulla presenza del genere *Hantkenina* Cushman 1924, in Italia.—Reale Accad. Ital., Rend. Sci. Fis., Mat., e Nat., vol. III, ser. VII, fasc. 2-5, 1941, pp. 141-145, text figs. 1-4.—Two species described and figured, neither new.

Marchesini, Enrico. Osservazioni sul terziario dei settori ad Est e Nord del gruppo del Monte Judica.—Boll. Soc. Geol. Ital., vol. LVI, fasc. 3, 1937, pp. 402-408.—A number of species listed.

Sulle trasgressioni posteoceniche nella regione compresa fra le sorgenti del Sele, dell'Ofanto e del Calore (Prov. Avellino).—L. c., vol. LIX, fasc. 2, 1940, pp. 302-308.—A few larger foraminifera listed.

Strati ad orbitoidi maestrichtiane nel Flysch del Sannio.—Atti Soc. Toscana Sci. Nat., Mem. vol. XLIX, 1941, pp. 1-21, pls. III, IV, [I, II].—A number of species listed, several described and figured, with two new varieties.

Trasgressioni e discordanze nella regione dell'alto corso dei fiumi Fortore e Miscano (Benevento).—L. c., Proc. Verb., vol. L, No. 4, 1941, pp. 1-14.—A few lists given.

Fauna a *Lepidocyclina* della breccia calcarea alla tempa petrelli presso Torella dei Lombardi (Avellino).—Ann. Mus. Geol. Bologna, ser. 2, vol. XV, 1941, pp. 1-27, pls. I-IV.—Lists of larger foraminifera given, a number described and figured, with two new varieties.

Orbitoidi cretacei del monte Conero presso Ancona.—Boll. Soc. Geol. Ital., vol. LX, fasc. 2-3, 1941, pp. 192-205, pl. XVIII.—Several species described and figured, none new.

Osservazioni quantitative sull'accrescimento relativo del plasmotracco di alcune *Nodosarinae*.—Comm. Pont. Acad. Sci., vol. VI, No. 18, 1942, pp. 735-783.—Relative measurements of several *Nodosariae* and other variations are given, and a list of species.

Marchesini, Enrico, and Gian Carlo Facca. Sulla variabilità di *Nummulites Fichteli* Michelotti.—Pal. Ital., Mem. Pal., vol. XL (n. ser. vol. X), Anno 1940-41, pp. 39-65 (1-27), pls. VII-X (I-IV), 16 tables and charts.—The variations of this species are charted and figured.

Stschedrina, Z. G. On the Distribution of Foraminifera in the Kara Sea.—Comptes Rendus Acad. Sci. URSS, vol. XIX, No. 4, 1938, pp. 319-322.—Notes are given with the distribution and relative abundance of 42 species and varieties.

A new genus of sand foraminifera from the Arctic seas.—L. c., vol. XXIV, No. 1, 1939, pp. 95, 96, text figs. 1, 2.—A new genus *Arenosphaera* (genotype *A. perforata* n. sp.) of the Saccamminidae is described and figured.

Gubler, Jean, and Raymond Levy. Le Bord Meridional des Unites Perifaines entre Moulay Vacoub et Fes (Maroc Occidental).—Notes et Memoires, Service des Mines et de la Carte geologique du Maroc, No. 52, 1940, pp. 1-35, maps.—Lists of foraminifera are given.

Gubler, Yvonne, and A. Vatan. Rythmes de sédimentation dans les zones de Nalzen, du Pech de Foix, et du Dreuilhe (Ariège) pendant les temps crétacés.—Bull. Soc. Géol. France, sér. 5, vol. XIII, 1943, pp. 299-331, pls. XII, XIII, 1 text fig.,

distribution chart.—Notes are given on some species and a chart shows distribution of many species.

Silvestri, Alfredo. Sulla faunula a Foraminiferi della Laguna Veneta.—Reale Accad. Ital., Rend. Sci. Fis., Mat., e Nat., vol. III, ser. VII, fasc. 6, 1942, pp. 319-322.—Notes of various species and a faunal list are given, with a few new names which are not described.

La *Lingulinopsis* di Castrocaro.—Riv. Ital. Pal., Anno XLVIII, fasc. 2, 1942, pp. 1-8, text figs. 1-3.—A list of species is given and a *Lingulinopsis* figured.

Silvestri, A., and P. Zangheri. Sulla faunula a foraminiferi di Capocolle (Forlì).—Boll. Soc. Geol. Ital., vol. LXI, fasc. 1-2, 1942, pp. 64-102, text figs. 1-8.—Many species noted, of which 5 species and 1 variety are new.

Colom, G. Los Foraminíferos de "concha arenacea" de las margas burdigalienses de Mallorca.—Instit. Invest. Geol., Estudios Geológicos, Num. 2, 1945, pp. 1-33, pls. I-XII.—Numerous arenaceous species and varieties described and figured, 7 new.

Estudio preliminar de las microfaunas de Foraminíferos de las margas eocenas y oligocenas de Navarra.—L. c., pp. 35-84, pls. I-VII.—Numerous species noted and figured, 4 new.

Los sedimentos burdigalienses de las Baleares.—L. c., Num. 3, 1946, pp. 21-112, pls. I-XVI.—Many species noted and figured, none new.

Los Foraminíferos de las margas vindobonienses de Mallorca.—L. c., pp. 113-180, pls. I-XIV, map.—Many species noted and figured, with 6 new species and varieties.

Notas sobre Foraminíferos fosiles.—Bol. Real Soc. Española Hist. Nat., vol. XLIII, 1945, pp. 283-295, pls. XXIX-XXXI, text figs.—Several species recorded, two new.

Nannoconus steinmanni Kamptner y *Lagena colomi* Lapparent.—Publ. Instit. Geol. "Miscelánea Almera," vol. 7, pt. 1a, 1945, pp. 123-132, text figs. 1, 2.—Describes and figures the above species.

LeCalvez, Jean. Place de la réduction chromatique et alternance de phases nucléaires dans le cycle des Foraminifères.—Comptes rendus des séances de l'Académie des Sciences, vol. 222, 1946, pp. 612-614.

Crespin, Irene. Note on Age and Palaeogeography of Brown Coal Deposits of Gippsland, Victoria.—Proc. Roy. Soc. Victoria, vol. LVII, pts. I-II (N. Ser.), 1945, pp. 49-56, text fig. and map.—Numerous foraminifera listed.

Phleger, Fred B., Jr. Vertical Distribution of Pelagic Foraminifera.—Amer. Journ. Sci., vol. 243, 1945, pp. 377-383.

van Bellen, Robert Carel. Foraminifera from the Middle Eocene in the southern part of the Netherlands Province of Limburg.—Proefschrift (Thesis) Univ. Utrecht, Maastricht, (Mededeelingen Geol. Stichting, ser. C-V, No. 4) 1946, pp. 1-145,

pls. 1-13, text figs. 1-11, chart.—Numerous species described and figured, many new, and two new genera: *Pseudopolymorphinoides* (genotype *P. limburgensis* n. sp.), and *Terquemia* (genotype *Rotalina lobata* Terquem).

van den Bold, Willem Aaldert. Contribution to the Study of Ostracoda with special reference to the Tertiary and Cretaceous Microfauna of the Caribbean Region.—Proefschrift (Thesis) Univ. Utrecht, Amsterdam, 1946, pp. 1-167, pls. I-XVIII, maps.—A few foraminifera are included (pp. 122-125, pl. XVIII) with 6 new species and 2 new genera: *Raadshoovenia* van den Bold (genotype *R. guatemalensis* n. sp.) in the Miliolidae, and *Boldia* van Bellen (genotype *Rotalina lobata* Terquem) in the Rotaliidae.

Detling, Mildred Riechers. Foraminifera of the Coos Bay Lower Tertiary, Coos County, Oregon.—Journ. Pal., vol. 20, No. 4, July 1946, pp. 348-361, pls. 46-51, 2 text figs.—Numerous species and varieties are described and figured, 3 new.

Stephenson, Morton B. Porters Creek Foraminifera of Illinois—corrections and comments.—L. c., pp. 391, 392.

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